Project Documentation | TMIB Data Sheet

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1 Traffic Management Interface Board Data Sheet

1.1 General Information

The Smartmicro TMIB (Traffic Management Interface Board) connects up to four UMRR Radar sensors (traffic detectors) to NEMA TS1 or TS2 cabinets (TMIB rack mount version); or to other traffic controllers (TMIB shelf mount version).

A TMIB set consists of two cards. The TMIB_AB assembly is the control board plus the interface board. This second board contains all surge and overvoltage protection circuitry for four long cables to four sensors, as it is the typical case on an intersection. One TMIB set can replace up to 16 inductive loops (TS1 usage) / up to 64 inductive loops (TS2 SDLC usage, up to four TS2 BIUs replaced).

The data of all four Radar sensors can be accessed conveniently through one single 100Base-TX Ethernet interface.

Rack-mount use:

In a typical (rack mount) installation, the TMIB consists of two NEMA form factor cards: The TMIB_AB assembly consisting of TMIB_A featuring TS1 loop contacts and status LEDs as well as the TMIB_B, which contains the sensor interface connections and the RS485/SDLC bus connectivity for TS2 cabinets. One TMIB can be connected to up to four "Inductive Loop Detector Unit" slots, replacing 16 inductive loops. In addition, up to three TMIB_C expansion cards may be installed. Each TMIB_C card offers four loop detector outputs. In NEMA TS1 installations they can be used to connect additional relay contacts to the traffic cabinet, because each TS1 card is limited to a maximum of four loop detector outputs.

Shelf-mount use:

In a typical (shelf mount) installation, the TMIB_AB assembly resides within an enclosure, offering all interfaces to the user.

The TMIB is well integrated in smartmicro's TMC (Traffic Management Configurator) PC software to give the installer a powerful and easy-to-use tool for setup and maintenance.

Please note: TMIB_A/B/C are not fully fail-safe devices. While a number of steps have been taken to make sure the devices show a fail-safe behavior, this cannot be assured under all conditions. The connected sensors (detectors) do not have 100% detection rate or zero false alarm rate (see data sheet). In case of communication problems, sensor failure, TMIB_A/B/C failure in part or in whole, under certain condition a non-fail-safe behavior may occur.

1.2 General Performance Data

Parameter	Value	Unit
Connectivity		
Supported traffic detectors	Smartmicro UMRR-0Axxxx with RS485/CAN output	
Supported outputs / interfaces	NEMA TS1 loop detector outputs NEMA TS2 SDLC bus 100Base-TX Ethernet	
Number of detectors per TMIB	Up to 4	
Number of virtual loops for NEMA TS2	Up to 16 per attached UMRR sensor Up to 64 total	
Number of loops replaced for NEMA TS1 (4 detector slots used)	Up to 16[1]	
NEMA TS2 Detector BIUs	Up to 4 (Detector BIU 8 thru 11)	
Environmental		
Ambient Temperature	NEMA TS2 compliant[2]	
Humidity	NEMA TS2 compliant	
Shock	NEMA TS2 compliant	
Vibration	NEMA TS2 compliant	
Mechanical		
Weight TMIB_AB Weight TMIB_C	360 / 12,7 130 / 4.59	g / oz
Dimensions	See section 4	
Model No.	**TMIB_AB-00xxyy** **TMIB_C-00xxyy**	
General		
Power Supply	10 ... 30 <2.5 (operational) / <1.3 (idle) 3.7 for each connected sensor	V DC W W
Form factor	NEMA TS1 / TS2 Inductive Loop Detector Unit	

[1] TMIB_C Extension cards required for more than 4 loop detector outputs.
[2] Batteries may have a reduced temperature range from -20°C to +70°C, the buzzer has a reduced temperature range of -30°C to +70°C. These constraints do not limit normal operation of the TMIB.

1.3 Device Photographs

Figure 1: TMIB_AB assembly.

Figure 1 shows a typical TMIB set installation, which consists of two NEMA cards: The TMIB_AB assembly consisting of TMIB_A featuring TS1 loop contacts and status LEDs as well as the TMIB_B, which contains the sensor interface connections and the RS485/SDLC bus connectivity for TS2 cabinets.

In addition, up to three TMIB_C daughter cards can be connected to a TMIB rack mount installation, each offering four additional TS1 loop contacts. For shelf mount installations, the TMIB_C daughter cards are not required.

Figure 2 shows the faceplates of the TMIB_AB and TMIB_C assemblies.

Figure 2: TMIB_A and TMIB_B and TMIB_C faceplates.

2 Features and Applications

2.1 Intersection Applications

NEMA cabinets are typically used to control actuated intersections. They observe the current traffic flow through a set of loop detectors and adopt the red and green phases of the traffic lights accordingly. While loop detectors are dependable and robust, they are also cost and service intensive. UMRR traffic detectors offer cost effective and seamless loop replacement through non-invasive radar technology. In order to connect them to NEMA TS1 or TS2 cabinets, the TMIB is used, which is installed into the detector rack.

2.1.1 NEMA TS1 Installations

For NEMA TS1 installations, loop detector outputs are emulated through opto-isolators. The TMIB_AB cards provide four loop detector outputs. Up to 16 loops total can be replaced using TMIB_AB and additional TMIB_C daughter cards - if multiple UMRR-0A sensors shall be connected to one TMIB.

2.1.2 NEMA TS2 Installations

For NEMA TS2 installations, all vehicle detections are transmitted over the SDLC serial link. Therefore only the TMIB itself (TMIB_AB assembly) is needed. Up to four Detector BIUs are supported with a total of 64 virtual loops.

2.1.3 Interfaces to Traffic Management Control systems

The TMIB offers on board 100Base-TX Ethernet interface for data retrieval and integration into Traffic Management Control systems.

2.2 General purpose applications

A shelf mount version offers the loop detector outputs and digital data interfaces in a boxed design – to support a variety of applications.

2.3 On-board diagnostics (BIT)

The TMIB has extensive means of onboard diagnostics through watchdog elements and LEDs on the front panel. General function can be instantly overlooked by Power Good, Heartbeat and Failure LEDs. Detailed diagnostics can be retrieved through data interfaces.

Signaling of error conditions can be adapted to customer requirements.

2.4 User interfaces

The TMIB provides the user interfaces displayed in Figure 3 and Figure 4.

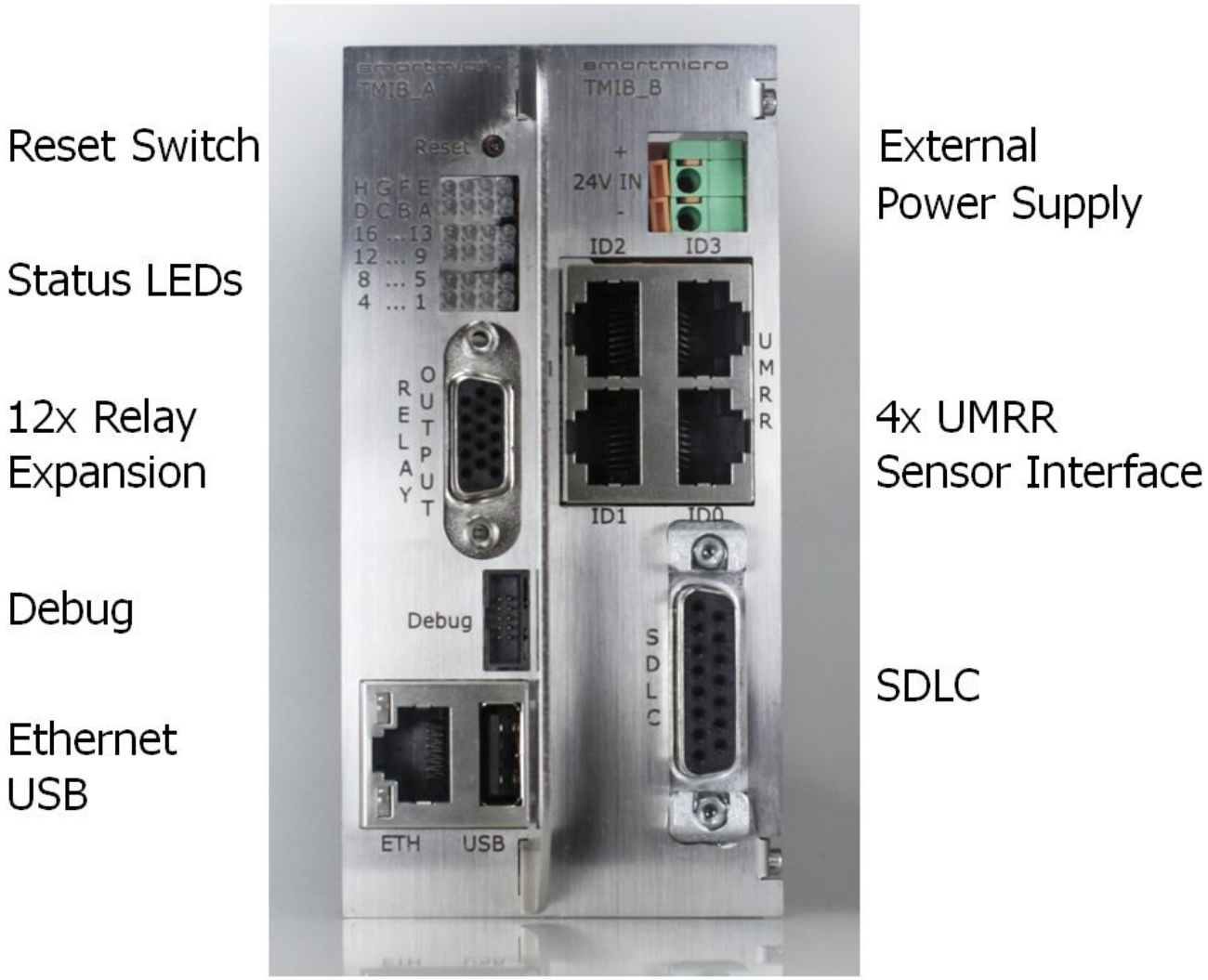

Figure 3: TMIB User interfaces (front panel)

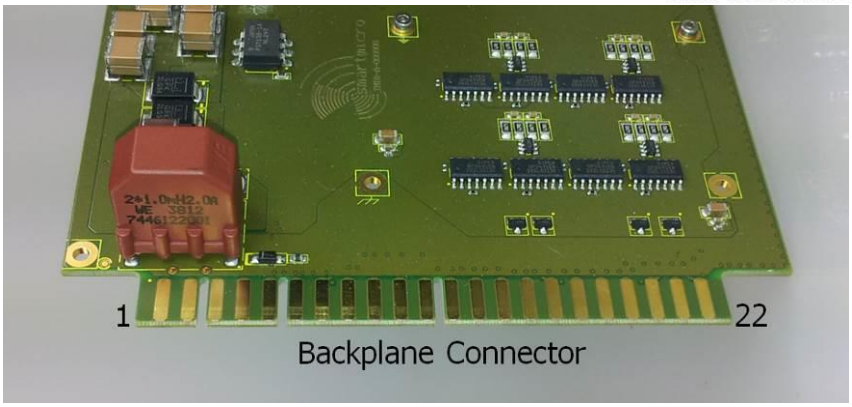

Figure 4: TMIB User interfaces (rear panel)

The user interfaces are:

- **Reset Switch** to allow the user to reset the TMIB device
- **Status LEDs** to display the TS1 and TS2 virtual loops states; also to provide diagnostics information such as Power Good, Heartbeat, Error states, SDLC Activity and others.
- **Relay Expansion** to connect to TMIB_C Relay Expansion cards (loop detector output channels 5 .. 16).
- **UMRR Sensor Interface** to connect to UMRR sensors via RS485 (see section 3.2).
- **Debug** for Debugging purposes by smartmicro trained personnel.
- **SDLC Port 1** connector.
- **Ethernet** (100Base-TX) interface.
- **USB** connector.
- NEMA TS1 / TS2 style **backplane multipoint pin header** (rack mount version) or Access to Power Supply / 4x loop detector outputs / SDLC (shelf mount version).

Please refer to the TMIB User Manual for detailed functional description.

3 Connection Scheme

The TMIB connects to up to four UMRR traffic detectors. It provides them with adequate supply voltage (sourced by the power supply terminal block at the TMIB front panel) and reads the data transmitted from or to all four sensors via CAN bus or RS485 data stream. To communicate with NEMA TS1 traffic controllers, the TMIB activates all loop detector outputs corresponding to triggered detection zones defined in the UMRR. In order to support NEMA TS2 systems, the TMIB also sends all assigned loop calls over a SDLC serial link.

The data from the four connected UMRR sensors can be retrieved through 100Base-TX Ethernet interface. Also the setup (alignment, placing of virtual loops etc.) of all four sensors can be conveniently accomplished through the one single Ethernet port.

3.1 Connecting four UMRR sensors to a controller through the TMIB

The connection scheme is displayed Figure 5 in below.

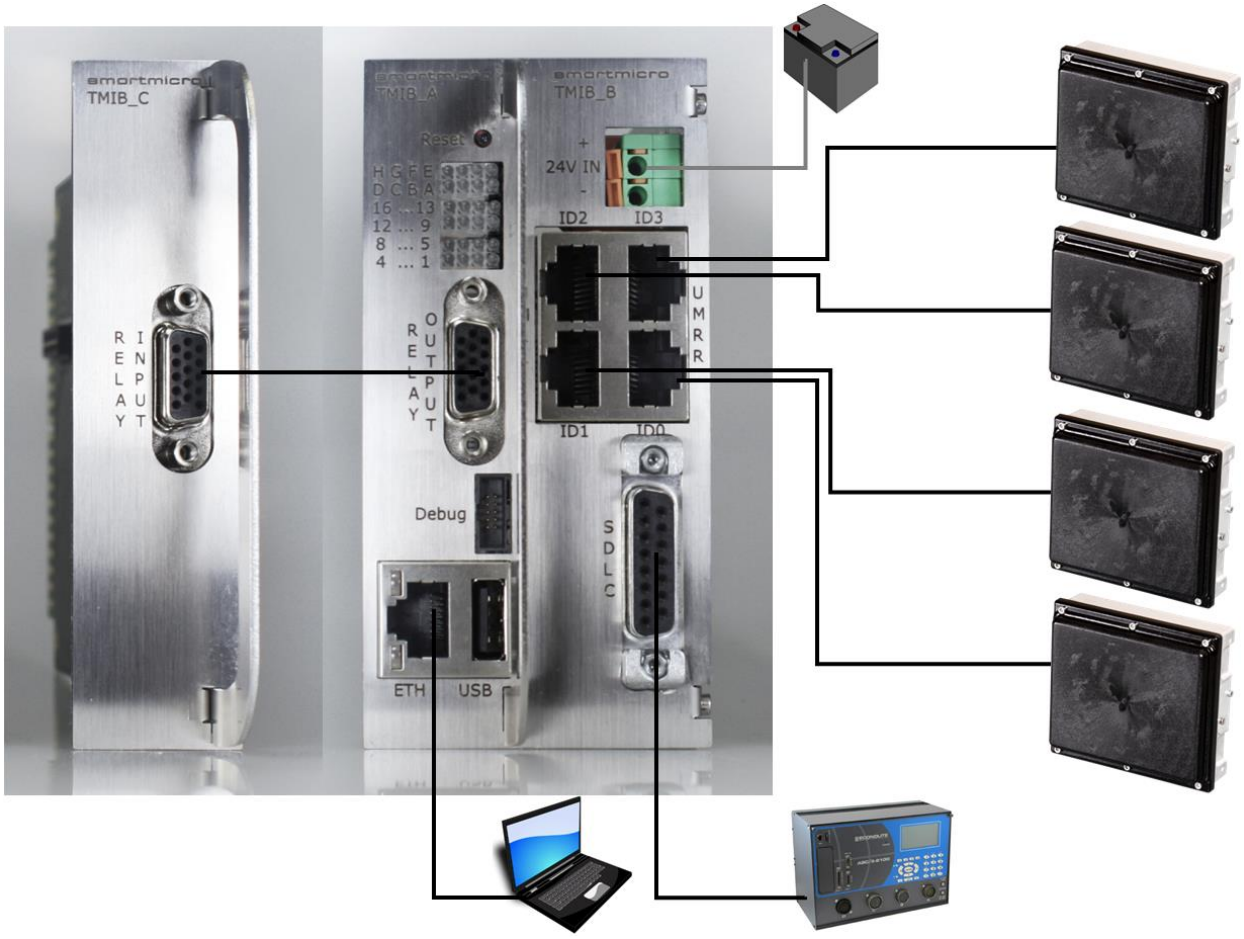

Figure 5: Connecting four UMRR sensors to a controller through the TMIB

3.2 Connecting UMRRs

The homerun cable of each UMRR-0A traffic sensor is fed to a patch panel inside the traffic cabinet, where it is wired to a short Cat5 cable with RJ-45 connector, which plugs in directly into the sensor interface block of the TMIB_B board.
The standard version uses duplicated power lines for optimal sensor supply on long, low cross-section cables. The pin-out of the TMIB and the corresponding junction box (JBOX) at the sensor is depending on the UMRR sensor you use (-0A or -0F) and the RS485 interface (half- or full-duplex). See the following tables for more details.

RJ-45 pin	Signal description	JBOX pin	Wire color EIA/TIA 568B (World)	Wire color EIA/TIA 568A (Europe)
1	**Sensor RS485 TX/RX L**	4	**White/orange**	**White-green**
2	**Sensor RS485 TX/RX H**	3	**Orange**	**green**
3	**CAN H**	1	**White/green**	**White-orange**
4	**SENSOR_VCC**	5	**Blue**	**Blue**
5	**SENSOR_GND**	6	**White/blue**	**White-blue**
6	**CAN L**	2	**Green**	**Orange**
7	**Sensor RS485 TX H**	**NC**	**White-brown**	**White-brown**
8	**Sensor RS485 TX L**	**NC**	**Brown**	**Brown**

Table 1: TMIB Half duplex version pin-out (UMRR-0A half-duplex RS485)

RJ-45 pin	Signal description	JBOX pin	Wire color EIA/TIA 568B (World)	Wire color EIA/TIA 568A (Europe)
1	**Sensor RS485 TX/RX L**	5	**White/orange**	**White-green**
2	**Sensor RS485 TX/RX H**	6	**Orange**	**green**
3	**CAN H**	11	**White/green**	**White-orange**
4	**SENSOR_VCC**	8	**Blue**	**Blue**
5	**SENSOR_GND**	7	**White/blue**	**White-blue**
6	**CAN L**	12	**Green**	**Orange**
7	**Sensor RS485 TX H**	**NC**	**White-brown**	**White-brown**
8	**Sensor RS485 TX L**	**NC**	**Brown**	**Brown**

Table 2: TMIB Half duplex version pin-out (UMRR-0F half-duplex RS485)

RJ-45 pin	Signal description	JBOX pin	Wire color EIA/TIA 568B (World)	Wire color EIA/TIA 568A (Europe)
1	**Sensor RS485 RX L**	5	**White/orange**	**White-green**
2	**Sensor RS485 RX H**	6	**Orange**	**green**
3	**CAN H**	11	**White/green**	**White-orange**
4	**SENSOR_GND**	8	**Blue**	**Blue**
5	**SENSOR_VCC**	7	**White/blue**	**White-blue**
6	**CAN L**	12	**Green**	**Orange**
7	**Sensor RS485 TX H**	4	**White-brown**	**White-brown**
8	**Sensor RS485 TX L**	3	**Brown**	**Brown**

Table 3: TMIB Full duplex version pin-out (UMRR-0F full-duplex RS485)

3.3 Connecting to the Backplane Connector (shelf mount version)

The Backplane Connector is located at the rear end of the shelf mount TMIB. The pin assignments (Table 1) are a 1:1 copy of the NEMA TS1 / TS2 backplane multipoint socket.

Pin	Signal description	Signal description	Pin
1	N.C.	Logic Ground	A
2	N.C.	Detector Unit DC Supply	B
3	N.C.	External Reset	C
4	N.C.	N.C.	D
5	N.C.	N.C.	E
6	N.C.	Channel 1 Output (+)	F
7	Channel 1 Status Output	Channel 1 Output (-)	H
8	N.C.	N.C.	J
9	N.C.	N.C.	K
10	N.C.	Chassis Ground	L
11	N.C.	N.C.	M
12	N.C.	N.C.	N
13	N.C.	N.C.	P
14	N.C.	N.C.	R
15	N.C.	Channel 3 Output (+)	S
16	Channel 3 Status Output	Channel 3 Output (-)	T
17	N.C.	N.C.	U
18	N.C.	N.C.	V
19	N.C.	Channel 2 Output (+)	W
20	Channel 2 Status Output	Channel 2 Output (-)	X
21	N.C.	Channel 4 Output (+)	Y
22	Channel 4 Status Output	Channel 4 Output (-)	Z

Table 1: Backplane Connector Pin Assignments

4 Mechanical Data

4.1 Dimensions of TMIB Assembly (TMIB_AB)

Width:	174.625 mm
Length:	114.3 mm
Thickness:	56.2mm incl. PCB with components, excl. front panel.
Size limit of TMIB_AB Assembly including front panel:	(59.44 x 114.3 x 177.8) mm (W x L x T).

4.2 TMIB_A Dimensions

Width:	174.625 mm
Length:	114.3 mm
Thickness:	34.1 mm incl. PCB and components on rear side.

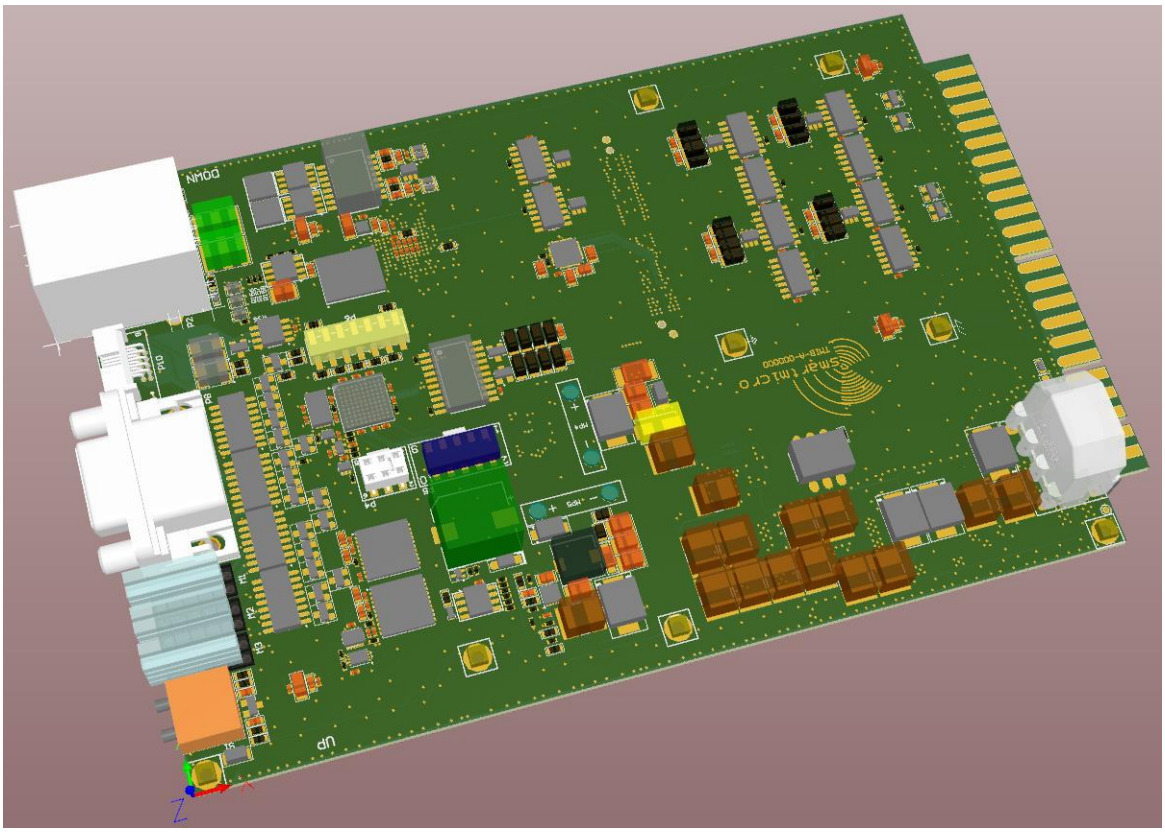

Figure 6: TMIB-A circuit board

4.3 TMIB_B Dimensions

Width:	114.3 mm
Length:	114.3 mm
Thickness:	26.9mm incl. PCB, excl. connection to TMIB_A.

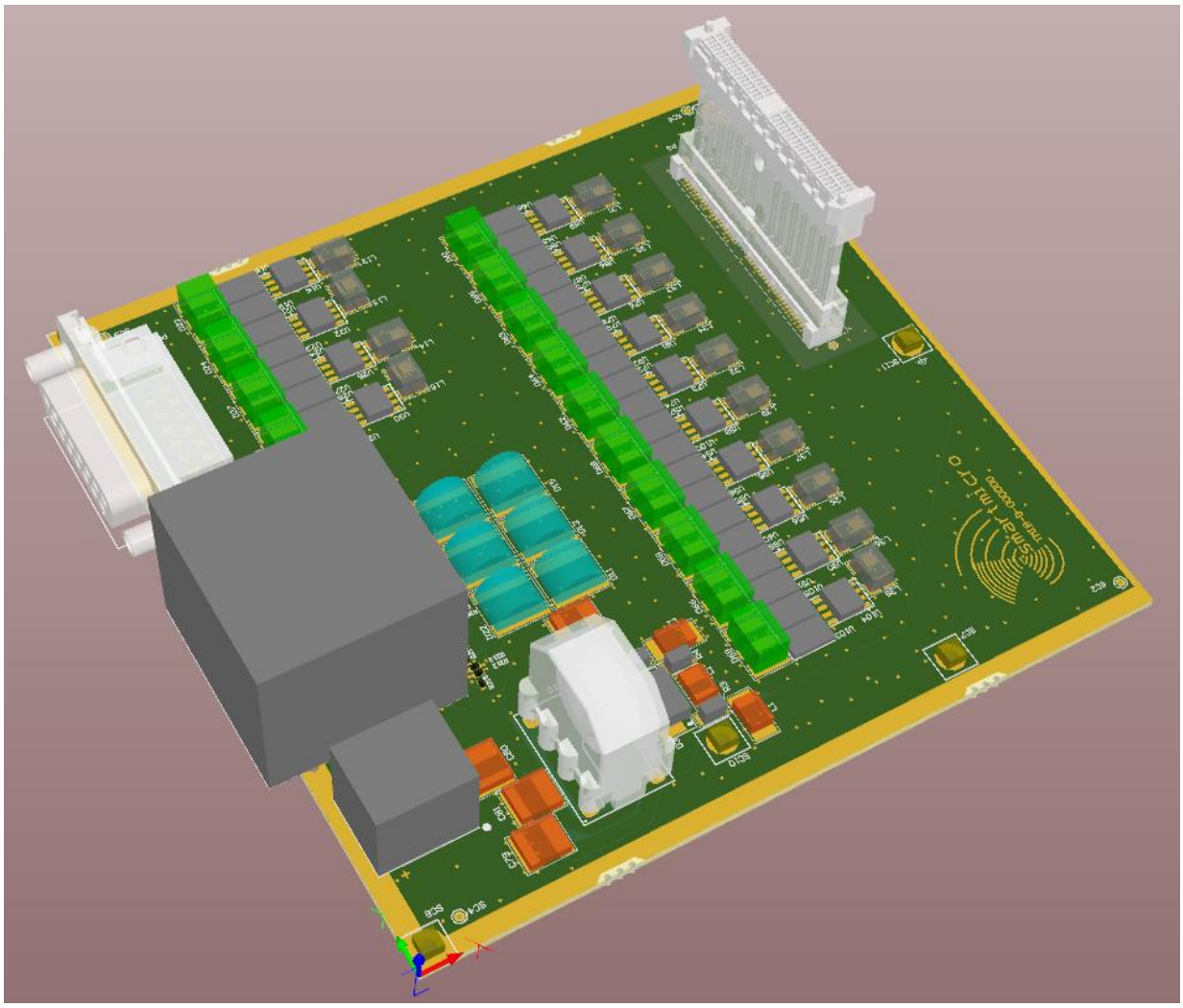

Figure 7: TMIB_B circuit board

4.4 TMIB_C Dimensions

Width:	174.625 mm
Length:	114.3 mm
Thickness:	17.6 mm incl. PCB.

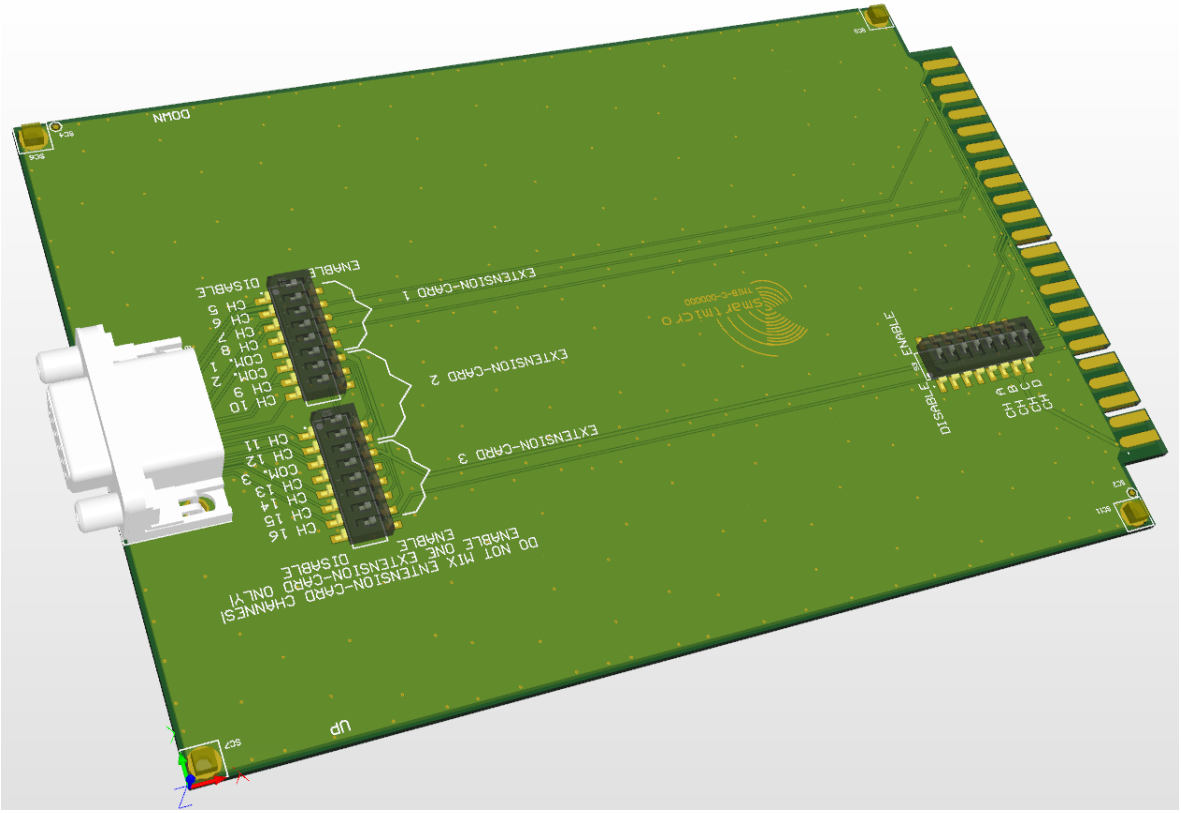

Figure 8: TMIB_C circuit board

4.5 Shelf Mount Housing Dimensions

Width:	119.5 mm
Length:	200 mm
Thickness:	64 mm

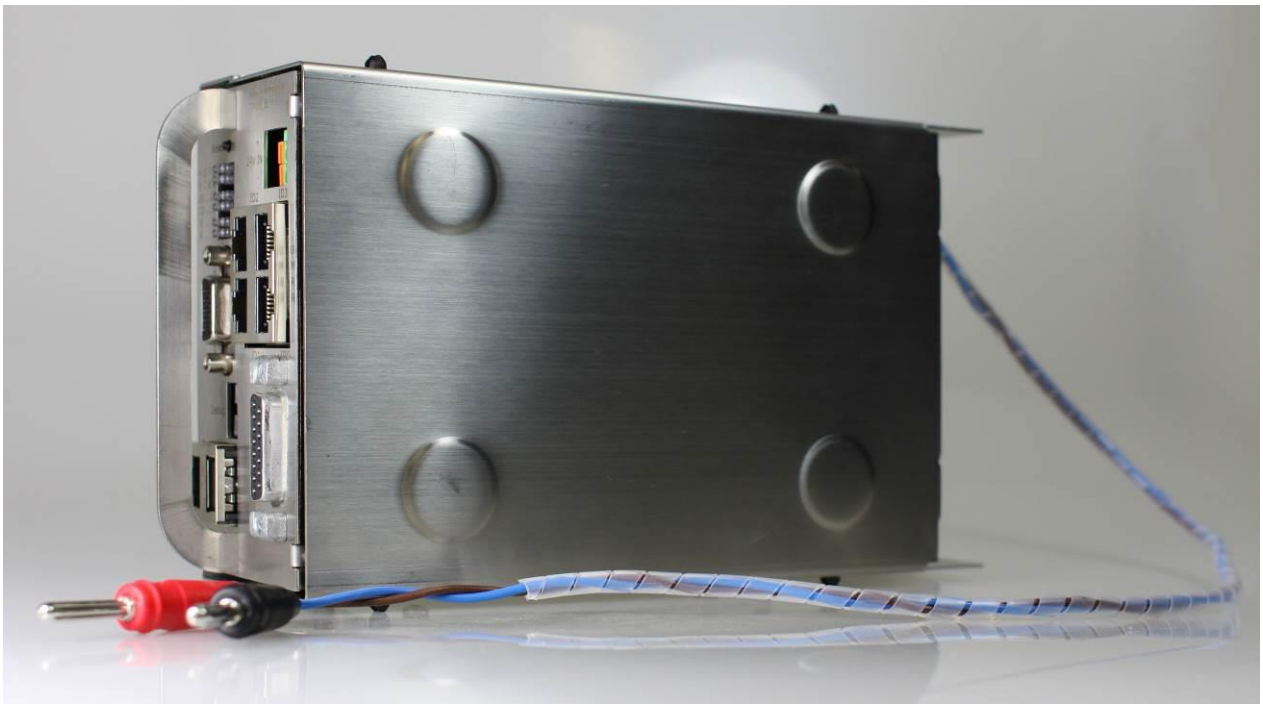

Figure 9: TMIB_AB in Shelf Mount Housing

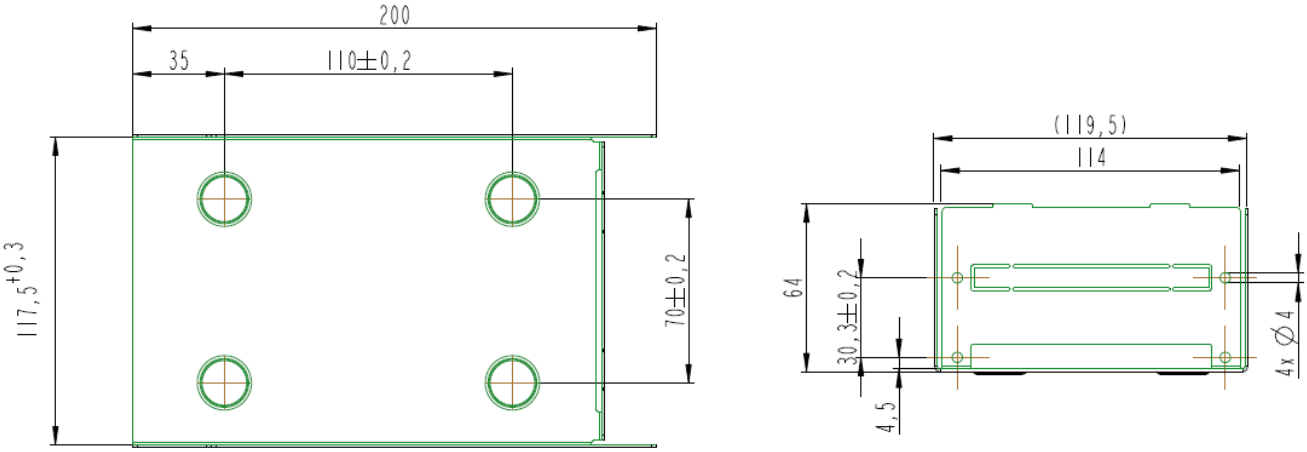

Figure 10: Dimensions of Shelf Mount Housing

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